Docket No.: WMB-12405

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Before the Board of Patent Appeals and Interferences

Applic. No.	:	10/584,759	Confirmation No.: 3936
Inventor	:	Rudolf Hirschmanner	
Filed	:	July 21, 2006	
Title	:	Method and Device for Converting Heat into Mechanical Work	
TC/A.U.	:	3748	
Examiner	:	Hoang M. Nguyen	
Customer No.	:	24131	

Hon. Commissioner for Patents

Alexandria, VA 22313-1450

BRIEF ON APPEAL

S i r :

This is an appeal from the final rejection in the Office action dated May 1, 2009, finally rejecting claims 16-35.

Appellants submit this *Brief on Appeal* including payment in the amount of $270.00 to cover the fee for filing the *Brief on Appeal*.

Real Party in Interest:

The inventor is the real party in interest.

Related Appeals and Interferences:

No related appeals or interference proceedings are currently pending which would directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

Status of Claims:

Claims 16-35 are rejected and are under appeal. Claims 1-15 were cancelled in an amendment dated June 27, 2006.

Status of Amendments:

No claims were amended after the final Office action. *A Notice of Appeal* was filed on October 1, 2009.

Summary of the Claimed Subject Matter:

The subject matter of each independent claim is described in the specification of the instant application. Examples explaining the subject matter defined in each of the independent claims, referring to the

specification by page and line numbers, and to the drawings, are given below.

Independent claim 16 reads as follows:

16. A method of converting heat into mechanical work, in a cyclic process comprising the following steps:

compressing [page 6, lines 27-30] a working medium [page 6, line 28] while giving off heat;

subsequently bringing the working medium [page 6, line 28] into thermal contact with an ambient environment [page 3, lines 26-27] through a first heat exchanger [page 6, lines 11-12; 11c, Fig. 1];

expanding [page 6, lines 11-13] the working medium [page 6, line 28] and thereby obtaining mechanical work [page 6, line 25];

guiding the working medium [page 6, line 28] through a second heat exchanger [page 6, line 32; 18, Fig. 1] disposed inside a rapidly rotating rotor [page 6, line 25; 13, Fig. 1], the rotor [page 6, line 25; 13, Fig. 1] including at least one substantially annular gas chamber [page 6, lines 33-34; 17a-17d; Fig. 1] surrounding the second heat exchanger [page 6, line 32; 18, Fig. 1]; and

radially dissipating heat away from the second heat exchanger [page 6, line 32; 18, Fig. 1], through the annular gas chamber [page 6, lines 33-34; 17a-17d; Fig. 1] and away from an exterior of the gas chamber [page 6, lines 33-34; 17a-17d; Fig. 1].

Independent claim 25 reads as follows:

25. An apparatus for converting heat into mechanical work, comprising:

a device [page 6, lines 27-28; 14, Fig. 1] for compressing a working medium [page 6, line 28];

a turbine [page 6, lines 9-10; 11, Fig. 1] configured to expand the working medium [page 6, line 28] to obtain mechanical work, said turbine [page 6, lines 9-10; 11, Fig. 1] including a first heat exchanger [page 6, lines 11-12; 11c, Fig. 1] configured to obtain [page 6, lines 28-30] the working medium [page 6, line 28] from the device [page 6, lines 27-28; 14, Fig. 1] and to subsequently bring the working medium [page 6, line 28] into thermal contact with an ambient environment [page 3, lines 26-27]; and

a rotor [page 6, line 25; 13, Fig. 1] having an axis defining an axial direction [page 6, line 27];

said rotor [page 6, line 25; 13, Fig. 1] including a second heat [page 6, line 32; 18, Fig. 1] exchanger disposed therein;

said second heat exchanger [page 6, line 32; 18, Fig. 1] configured to conduct the working medium [page 6, line 28] substantially in the axial direction [Fig. 1], having a substantially ring-cylindrical configuration [page 6, line 34], and being outwardly bounded by a substantially cylindrical wall;

said rotor [page 6, line 25; 13, Fig. 1] including a substantially annular gas chamber [page 6, lines 33-34; 17a-17d; Fig. 1] divided, in a radial direction, into a plurality of ring-cylindrical partial chambers [page 6, lines 33-34; 17a-17d; Fig. 1];

said annular gas chamber [page 6, lines 33-34; 17a-17d; Fig. 1] configured to radially conduct heat away from said second heat exchanger [page 6, line 32; 18, Fig. 1]; and

said second heat exchanger [page 6, line 32; 18, Fig. 1] being surrounded [Fig. 1] by said annular gas chamber [page 6, lines 33-34; 17a-17d; Fig. 1].

Grounds of Rejection to be Reviewed on Appeal

1. Whether or not claims 25, 27-29, and 32-33 are anticipated by U.S. Patent No. 4,004,426 (Laing) under 35 U.S.C. § 102(b).

2. Whether or not claims 16-25, 27-29 and 32-35 are obvious over U.S. Patent No. 4,004,426 (Laing) in view of U.S. Patent No. 3,956,899 (Kronogard) under 35 U.S.C. § 103(a).

3. Whether or not claim 26 is obvious over U.S. Patent No. 4,004,426 (Laing) in view of U.S. Patent No. 4,781,241 (Misage et al.) under 35 U.S.C. § 103(a).

4. Whether or not claim 30 is obvious over U.S. Patent No. 4,004,426 (Laing) in view of DE 3807783 under 35 U.S.C. § 103(a).

5. Whether or not claim 31 is obvious over U.S. Patent No. 4,004,426 (Laing) in view of U.S. Patent No. 6,491,141 (Severinsson) under 35 U.S.C. § 103(a).

Argument:

Claims 25, 27-29, 32-33 are not anticipated by Laing

Laing teaches an evaporating heat exchanger 1 that is supplied with heat from a heat source 9 (column 3, lines 19-20 and lines 30-39). Laing also teaches an annular condensing heat exchanger 3 for condensing the working fluid (column 3, lines 22-23 and column 4, lines 11-24). Laing teaches that the working fluid is evaporated in the tubes 121 of the annular evaporating heat exchanger 1, then the working fluid reaches the displacement motor 2 (turbine), and then after expansion, flows through the tubes 31 of the annular condensing heat exchanger 3 (column 3, lines 19-23).

Claim 25 includes a device for compressing a working medium, a turbine with a first heat exchanger that obtains the working medium from the device for compressing the working medium, and a rotor with a second heat exchanger configured to conduct the working medium in the axial direction. The first heat exchanger brings the working medium, which has been obtained from the device for compressing the

working medium, into thermal contact with the ambient environment. The turbine expands the working medium to obtain mechanical work. The second heat exchanger is configured to conduct the working medium substantially in the axial direction. The rotor also includes an annular gas chamber that radially conducts heat away from the second heat exchanger.

The teaching in Laing cannot satisfy all of the limitations copied above.

Respectfully, appellant mentions that it is difficult to determine exactly which components of Laing, the Examiner has equated with the features of claim 25.

Appellant points out that the term “heat exchanger” has a well defined meaning in the art. One of ordinary skill in the art would not consider heat storage devices, such as the heat storage containers 15 and the fusible heat storage substance 312 to be heat exchangers. Furthermore, the heat storage containers 15 are located on the fins 13 of the evaporator heat exchanger 1 and are therefore a part of the evaporator heat exchanger 1 (See Fig. 3a and column 6, lines 32-40).

The fusible heat storage substance 312 is located in the tubes 31 of the condensing heat exchanger 3 and is therefore a part of the condensing heat exchanger 3 (See Fig. 3c and column 6, line 66 –column 7, line 3). Appellant believes it is clear to one of ordinary skill in the art that the only heat exchangers taught by Laing are the evaporator heat exchanger 1 and the condensing heat exchanger 3.

Appellant next points out that claim 25 specifies that the rotor includes an annular gas chamber that radially conducts heat away from the second heat exchanger. The Examiner references the tubes 121 of the annular evaporating heat exchanger 1 and the tubes 31 of the annular condensing heat exchanger 3 and alleges that these tubes can be considered to be an annular gas chamber. However, the respective tubes 121, 31 are necessary parts to form the respective heat exchangers 1, 3. Since the tubes 121, 31 are an integral part of a respective heat exchanger 1 or 3, the tubes 121, 31 cannot be used to satisfy the limitations of an annular gas chamber that that conducts heat away from the respective heat exchanger 1 or 3.

Appellant next points out that Laing does not teach a device for compressing a working medium as required by claim 25.

Appellant next points out that Laing teaches that the working fluid passes through an annular evaporating heat exchanger 1 and then passes through the displacement motor 2. Therefore, logically, one of ordinary skill in the art would compare the annular evaporating heat exchanger 1 of Laing with the first heat exchanger of claim 25. This is because claim 25 specifies that the turbine includes a first heat exchanger configured to obtain the working medium from the device for compressing the working medium. The heat exchanger 3 of Laing obtains the working medium after it has been expanded (See column 3, lines 19-23); it does not obtain a compressed working medium. In this case, however, the annular evaporating heat exchanger 1 of Laing cannot satisfy the limitations of the first heat exchanger of claim 25. Claim 25 specifies that the first heat exchanger brings the working medium into contact with the ambient environment; however, Laing teaches that a heat source 9 supplies the annular evaporating heat exchanger 1 with heat (column 3, lines 30-39). The annular evaporating heat exchanger 1 of Laing does not bring the working medium into thermal contact with the ambient environment and

therefore it cannot satisfy the limitations placed on the first heat exchanger defined in claim 25.

The invention as defined by claim 25 is not anticipated by Laing. The invention as defined by claims 27-29, and 32-33 is not anticipated for the reasons given above with regard to claim 25 and the teaching in Laing.

Claims 16-25, 27-29 and 32-35 are not obvious over Laing in view of Kronogard

Claim 25 and the claims that depend from claim 25 are argued separately from claim 16 and the claims that depend from claim 16.

Claims 25, 27-29, and 32-34

The invention as defined by claims 25, 27-29, and 32-34 would not have been suggested because of the deficiencies in the teaching in Laing that have been discussed above in the anticipation rejection of claim 25. Even if the teachings of Laing and Kronogard were combined the invention as defined by claims 25, 27-29, and 32-34 would not have

been suggested. For completeness, the previous arguments are also copied below.

Laing teaches an evaporating heat exchanger 1 that is supplied with heat from a heat source 9 (column 3, lines 19-20 and lines 30-39). Laing also teaches an annular condensing heat exchanger 3 for condensing the working fluid (column 3, lines 22-23 and column 4, lines 11-24). Laing teaches that the working fluid is evaporated in the tubes 121 of the annular evaporating heat exchanger 1, then the working fluid reaches the displacement motor 2 (turbine), and then after expansion, flows through the tubes 31 of the annular condensing heat exchanger 3 (column 3, lines 19-23).

Claim 25 includes a device for compressing a working medium, a turbine with a first heat exchanger that obtains the working medium from the device for compressing the working medium, and a rotor with a second heat exchanger configured to conduct the working medium in the axial direction. The first heat exchanger brings the working medium, which has been obtained from the device for compressing the working medium, into thermal contact with the ambient environment.

The turbine expands the working medium to obtain mechanical work. The second heat exchanger is configured to conduct the working medium substantially in the axial direction. The rotor also includes an annular gas chamber that radially conducts heat away from the second heat exchanger.

The teaching in Laing cannot satisfy all of the limitations copied above and therefore, even if Kronogard suggested the features that have been alleged by the Examiner, the combination of Laing and Kronogard would not have suggested the invention as defined by claim 25.

Respectfully, appellant mentions that it is difficult to determine exactly which components of Laing, the Examiner has equated with the features of claim 25.

Appellant points out that the term “heat exchanger” has a well defined meaning in the art. One of ordinary skill in the art would not consider heat storage devices, such as the heat storage containers 15 and the fusible heat storage substance 312 to be heat exchangers. Furthermore, the heat storage containers 15 are located on the fins 13

of the evaporator heat exchanger 1 and are therefore a part of the evaporator heat exchanger 1 (See Fig. 3a and column 6, lines 32-40). The fusible heat storage substance 312 is located in the tubes 31 of the condensing heat exchanger 3 and is therefore a part of the condensing heat exchanger 3 (See Fig. 3c and column 6, line 66 –column 7, line 3). Appellant believes it is clear to one of ordinary skill in the art that the only heat exchangers taught by Laing are the evaporator heat exchanger 1 and the condensing heat exchanger 3.

Appellant next points out that claim 25 specifies that the rotor includes an annular gas chamber that radially conducts heat away from the second heat exchanger. The Examiner references the tubes 121 of the annular evaporating heat exchanger 1 and the tubes 31 of the annular condensing heat exchanger 3 and alleges that these tubes can be considered to be an annular gas chamber. However, the respective tubes 121, 31 are necessary parts to form the respective heat exchangers 1, 3. Since the tubes 121, 31 are an integral part of a respective heat exchanger 1 or 3, the tubes 121, 31 cannot be used to satisfy the limitations of an annular gas chamber that that conducts heat away from the respective heat exchanger 1 or 3.

Appellant next points out that Laing does not teach a device for compressing a working medium as required by claim 25.

Appellant next points out that Laing teaches that the working fluid passes through an annular evaporating heat exchanger 1 and then passes through the displacement motor 2. Therefore, logically, one of ordinary skill in the art would compare the annular evaporating heat exchanger 1 of Laing with the first heat exchanger of claim 25. This is because claim 25 specifies that the turbine includes a first heat exchanger configured to obtain the working medium from the device for compressing the working medium. The heat exchanger 3 of Laing obtains the working medium after it has been expanded (See column 3, lines 19-23); it does not obtain a compressed working medium. In this case, however, the annular evaporating heat exchanger 1 of Laing cannot satisfy the limitations of the first heat exchanger of claim 25. Claim 25 specifies that the first heat exchanger brings the working medium into contact with the ambient environment; however, Laing teaches that a heat source 9 supplies the annular evaporating heat exchanger 1 with heat (column 3, lines 30-39). The annular evaporating heat exchanger 1 of Laing does not bring the working

medium into thermal contact with the ambient environment and therefore it cannot satisfy the limitations placed on the first heat exchanger defined in claim 25.

Claims 16-24

Claim 16 defines a method including steps of:

compressing a working medium while giving off heat; and

subsequently bringing the working medium into thermal contact with an ambient environment through a first heat exchanger.

The Examiner has admitted that Laing does not teach such steps, however the Examiner has alleged that Kronogard teaches these steps. Appellant respectfully disagrees.

Kronogard teach that a circulating medium is compressed in a compressor 15 and is then fed to a heat exchanger 18 where the circulating medium is heated by the exhaust of the gas turbine. The circulating medium is then fed to a second heat exchanger 19 where the circulating medium is heated further (see column 2, lines 11-15).

The second heat exchanger 19 obtains heat from combustion (see column 2, lines 29-35). In contrast to the steps of claim 16 copied above, neither heat exchanger 18 or 19 of Kronogard brings the circulating medium into thermal contact with an ambient environment.

Laing does not teach anything relating to compressing a working medium while giving off heat. Furthermore, the first heat exchanger 1 taught by Laing obtains heat from the heat source 9 (see column 3, lines 30-37). The first heat exchanger 1 of Laing does not bring the working medium into thermal contact with an ambient environment.

The invention as defined by claim 16 could not have been suggested by the teachings in Laing and Kronogard. Claims 17-24, which depend from claim 16, would also not have been suggested.

Claim 26 is not obvious over Laing in view of Misage

Even if it would have been obvious to combine the teachings in Laing and Misage, the invention as defined by claim 26 would not have been suggested for the reasons specified above with regard to claim 25 and the teaching in Laing.

Claim 30 is not obvious over Laing in view of German Patent Application No. DE 38 07 783 A1

Even if it would have been obvious to combine the teachings in Laing and German Patent Application No. DE 38 07 783 A1, the invention as defined by claim 30 would not have been suggested for the reasons specified above with regard to claim 25 and the teaching in Laing.

Claim 31 is not obvious over Laing in view of Severinsson

Even if it would have been obvious to combine the teachings in Laing and Severinsson, the invention as defined by claim 26 would not have been obtained for the reasons specified above with regard to claim 25 and the teaching in Laing.

The honorable Board is therefore respectfully urged to reverse the final rejection of the Primary Examiner.

If an extension of time is required for this submission, petition for extension is herewith made. Any fees due should be charged to Deposit Account No. 12-1099 of Lerner Greenberg Stemer LLP.

Respectfully submitted,

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Claims Appendix:

16. A method of converting heat into mechanical work, in a cyclic process comprising the following steps:

compressing a working medium while giving off heat;

subsequently bringing the working medium into thermal contact with an ambient environment through a first heat exchanger;

expanding the working medium and thereby obtaining mechanical work;

guiding the working medium through a second heat exchanger disposed inside a rapidly rotating rotor, the rotor including at least one substantially annular gas chamber surrounding the second heat exchanger; and

radially dissipating heat away from the second heat exchanger, through the annular gas chamber and away from an exterior of the gas chamber.

17. The method according to claim 16, which comprises guiding the working medium through a compressor downstream of the rotor, in a working medium flow direction.

18. The method according to claim 16, wherein the working medium takes up ambient heat in the first heat exchanger.

19. The method according to claim 16, which comprises conducting the working medium through the rotor substantially in an axial direction thereof.

20. The method according to claim 16, wherein a temperature difference is built up in the rotor of at least 100 K.

21. The method according to claim 20, wherein a temperature difference is built up in the rotor of at least 300 K.

22. The method according to claim 21, wherein a temperature difference is built up in the rotor of at least 500 K.

23. The method according to claim 16, which comprises dissipating the heat via cooling ribs on an outside of the rotor.

24. The method according to claim 16, which comprises dissipating the heat through a third heat exchanger on an outside of the rotor.

25. An apparatus for converting heat into mechanical work, comprising:

a device for compressing a working medium;

a turbine configured to expand the working medium to obtain mechanical work, said turbine including a first heat exchanger configured to obtain the working medium from the device and to subsequently bring the working medium into thermal contact with an ambient environment; and

a rotor having an axis defining an axial direction;

said rotor including a second heat exchanger disposed therein;

said second heat exchanger configured to conduct the working medium substantially in the axial direction, having a substantially ring-cylindrical configuration, and being outwardly bounded by a substantially cylindrical wall;

said rotor including a substantially annular gas chamber divided, in a radial direction, into a plurality of ring-cylindrical partial chambers;

said annular gas chamber configured to radially conduct heat away from said second heat exchanger; and

said second heat exchanger being surrounded by said annular gas chamber.

26. The apparatus according to claim 25, wherein said partial chambers are configured to receive mutually different gases.

27. The apparatus according to claim 26, which comprises a pressure control device communicating with said ring-cylindrical partial chambers for setting an internal pressure therein.

28. The apparatus according to claim 27, wherein said pressure control device is disposed in a region of said axis of said rotor.

29. The apparatus according to claim 25, which comprises cylindrical separating walls separating said ring-cylindrical partial chambers from one another.

30. The apparatus according to claim 25, wherein the working medium is fed in and discharged, respectively, through shafts of said rotor.

31. The apparatus according to claim 25, which comprises a housing with magnets disposed to hold said rotor in said housing by exerting an inwardly directed magnetic force on a circumference of said rotor.

32. The apparatus according to claim 25, wherein said gas chamber is subdivided in the radial direction into at least three ring-cylindrical partial chambers.

33. The apparatus according to claim 25, wherein said gas chamber is subdivided in the radial direction into at least four ring-cylindrical partial chambers.

34. The apparatus according to claim 25, wherein said first heat exchanger is configured to isothermally expand the working medium.

35. The method according to claim 16, which comprises isothermally expanding the working medium while performing the step of subsequently bringing the working medium into thermal contact with the ambient environment.

Evidence Appendix:

No evidence pursuant to §§ 1.130, 1.131, or 1.132 or any other evidence has been entered by the Examiner and relied upon by appellant in the appeal.

Related Proceedings Appendix:

No prior or pending appeals, interferences or judicial proceedings are in existence which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this appeal. Accordingly, no copies of decisions rendered by a court or the Board are available.